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New findings on the original surface finish of a wooden sculpture by Tilman Riemenschneider

Novas descobertas sobre o acabamento original da superfície de uma escultura de madeira de Tilman Riemenschneider

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Abstract

The Germanisches Nationalmuseum Nuremberg (GNM) owns a total of eight sculptures from the workshop of Tilman Riemenschneider. The depiction of Saint Elizabeth of Thuringia, created around 1510, is considered his own work and most probably comes from the central shrine of an altarpiece. The preserved layers of paint can be attributed to two different phases of polychromy. The technological and stylistic characteristics of the oldest polychromy point to its creation in the 17th century. Underneath, there are remnants of a reddish coating on the smoothed wood. Material analyses (SEM/EDX, FT-IR, Raman-spectroscopy, HPLC-PDA-HRMS, LC-MS/MS) identified a thin, sparsely pigmented protein coating directly on the wooden surface without any dirt or dust in between. This glaze seems to be the original finish that protected, refined and slightly coloured the raw limewood. The findings provide a contribution to the understanding of the type of monochrome sculptures, in particular from the workshop of Tilman Riemenschneider.

KEYWORDS
Riemenschneider
Monochrome
Unpolychromed
Holzsichtig
Sculpture
Altarpiece

Resumo

O Germanisches Nationalmuseum Nuremberg (GNM) possui um total de oito esculturas da oficina de Tilman Riemenschneider. A representação de Santa Elisabete da Turíngia, realizada por volta de 1510, é considerada uma obra sua e provém, muito provavelmente, do altar central de um retábulo. As camadas de pintura conservadas podem ser atribuídas a duas fases diferentes da policromia. As caraterísticas tecnológicas e estilísticas da policromia mais antiga apontam para a sua criação no século XVII. Por baixo, há vestígios de um revestimento avermelhado sobre a madeira alisada. As análises do material (SEM/EDX, FT-IR, espetroscopia Raman, HPLC-PDA-HRMS, LC-MS/MS) permitiram identificar um revestimento proteico fino e pouco pigmentado aplicado diretamente sobre a superfície da madeira, sem qualquer sujidade ou poeira entre eles. Esta velatura parece ser o acabamento original que protegeu, refinou e coloriu ligeiramente a madeira de tília. Os resultados contribuem para a compreensão do tipo de esculturas monocromáticas, em particular da oficina de Tilman Riemenschneider.

PALAVRAS-CHAVE
Riemenschneider
Monocromático
Não policromado
Holzsichtig
Escultura
Retábulo

Introduction

The Germanisches Nationalmuseum Nuremberg owns a total of eight sculptures from the workshop of Tilman Riemenschneider. The approximately 110 cm high depiction of Saint Elizabeth of Thuringia (Inv.No. Pl.O.2413), created around 1510, is considered his own work. It most probably comes from the central shrine of an altarpiece to which two further sculptures may be assigned, which are now in private ownership in the US (Saint Catherine) and in the Compton Verney Art Gallery in the UK (Unknown Female Saint) (Figure 1).

The three sculptures were presented together for the first time at the major Riemenschneider exhibition at the MET in 2000. Even though the surfaces look quite different today after individual treatments over time, there are several indications that the sculptures originally belonged together [1, pp. 326-331]. Due to the very finely crafted surfaces, it was assumed that they were formerly unpainted. The aim of this study is to address these issues. Due to the lack of relevant traces on Saint Catherine and the Female Saint, the examinations at Saint Elizabeth are of particular importance. The investigations are being carried out as part of the current conservation treatment of the sculpture.

Figure 1. Sculptures from the workshop of Tilman Riemenschneider: *a)* Female Saint (Compton Verny Art Gallery, UK; CVCSC:0271.N, photograph: J. Woodley); *b)* Saint Catherine (Private Collection, USA, photograph: bpk/ Metropolitan Museum of Art); *c)* Saint Elizabeth (GNM, Pl.O.2413).

Phenomenon of so called "Holzsichtigkeit"

For a better understanding of the results presented below, the phenomenon of the unpolychromed sculpture should be introduced. This phenomenon, known in German as “Holzsichtigkeit”, began to appear in the second half of the fifteenth century in Germany and reached a peak shortly after 1500, especially in Franconia and Swabia. With the rapid development of carving techniques in the late fifteenth century, the sculptures attained such great refinement and naturalistic detail that no polychromy was needed to enhance their effect. Surface areas could be delineated and organized by means of stippling, appliqués and cut decorations or fabric imitations instead of different coloured paint layers or metal leaves. Such unpolychromed surfaces were certainly never left bare and untreated but were at least given a (protective) transparent coating.

There are several examples of late medieval altarpieces that remained without polychromy for several years and decades after their production. The Lorch altarpiece from 1483 is still considered to be the oldest altarpiece designed without polychromy that has survived to this day. A yellowish-transparent, glossy coating was found directly on the wood of the sculptures and the outside of the wings, which optically unified and preserved the surface [2]. The oldest, now lost polychromy of the carving work dates back to 1719 [3, p.122]. Holes in the wings indicate that the reliefs were once attached to the inside. The oldest paintings on the wings date from 1597 and are executed as grisailles, so were probably made in relation to the monochrome effect of the carving. The findings show that the altarpiece was not polychromed until the eighteenth century.

Characteristics and intentionality

The still highly controversial question of whether the altarpieces, which initially remained unpainted, were planned and commissioned without polychromy and were considered finished in this state, cannot be answered in general terms. This topic has been the subject of much controversy in recent decades, with the arguments being strongly influenced by the respective professional backgrounds and the associated subjective perspectives of the debaters. In addition to the effects of Reformation developments on the intentions of the patrons, two main explanatory approaches have been pursued in the more recent debate: One cites practical external circumstances such as funding difficulties as the trigger or at least companion to this development; the other points to a fundamental change in the aesthetic perception of sculpture that went hand in hand with the increasing technical mastery of the sculptors. A more detailed summary of the positions is not provided here, and reference is made to the relevant literature [4-16]. It is undisputed that larger altarpieces, in particular, were often set up without polychromy but were polychromed a few to several years later. Georg Habenicht cites several examples for this procedure [6, p. 104]. There may have been different reasons for this in individual cases. It is certain, however, that these altar pieces which were delivered without polychromy, initially had to be convincing on its own merits. It therefore seems only logical that the carvers not only had the ambition to complete their works as perfectly as possible but wanted to protect their surfaces against dirt and dust and, also sought to enhance the surfaces appearance in some way – for example with thin coatings and coloured accentuations.

Terminology

The issue of the terminology is just as controversial as the intentionality of the phenomenon. The difficulties in defining a uniform term arise on the one hand from the many uncertainties that still prevail about the actual original appearance and the motifs for this, and on the other hand from the diversity of characteristics of an unpolychromed surface, which can vary from transparent to slightly coloured to clearly pigmented coatings. In addition, there can be brighter coloured accentuations of the eyes, mouths and sometimes of additional details, which makes the transition to a "partial polychromy" fluid. These accentuations can be made directly

on the wood surface or on the coating. In order to find a valid terminology, the uncertainties about the various manifestations of the phenomenon must be reduced by new and comparative findings.

As almost all the sculptures thought to have been unpolychromed were overpainted over time (often several times) and the layers of paint were later removed from many of them, most traces of the original surface design have been lost. As a result, there are only a few examples where it is possible to determine with a high degree of probability what the original surface may have once looked like.

New findings on Saint Elizabeth

The wooden support

The figures of Saint Elizabeth, Saint Catherine and The Female Saint are each carved from a block of limewood with their backs hollowed. In the case of Saint Elizabeth, a larger piece of a robe fold has been added originally (Figure 2a). Also, there is a smaller original repair in the area of her right shoulder, where a knot had apparently been removed (Figure 2a).

The Female Saint also had an originally added piece of a fold, which is now lost. Several knots, however, remained in the wood [17].

Figure 2. Mapping of original wooden addings and repairs at: *a-b)* St. Elizabeth (GNM, Pl.O.2413); *c)* Seated Bishop (The Metropolitan Museum of Art, The Cloisters, 1970.137.1).

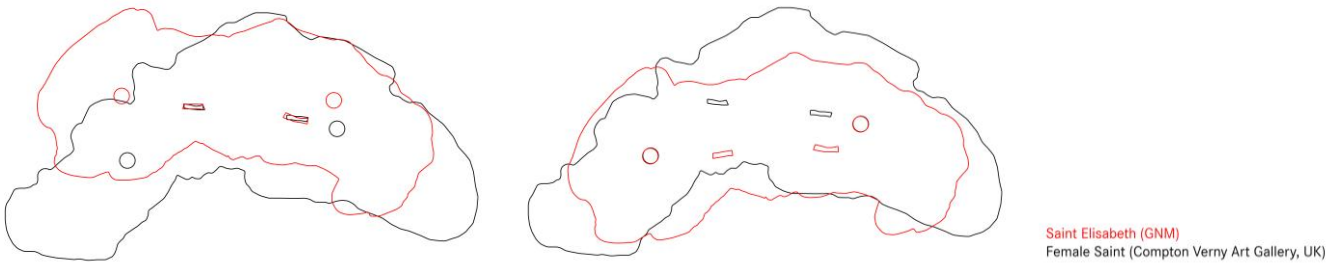

Figure 3. Tracings of the original impressions of a two-pronged clamping tool (slim, rectangular) from the workbench and younger drill holes (circular) at Saint Elizabeth's bottom and the Female Saint's bottom.

Two pieces of wood are added in Elizabeth's back, where the wood became too thin and was carved through (Figure 2b). This technique of repairing with rather large pieces of wood is not unusual for the Riemenschneider workshop, even though there are only smaller repairings at Saint Catherine and the Female Saint. But you can find it for example at the Seated Bishop from The Cloisters at The Metropolitan Museum of Art (Figure 2c)

From a technological point of view, in addition to the matching dimensions and similar manufacturing techniques, one feature confirms the assumption of togetherness of Elizabeth, Catherine and the Unknown Saint: There is a vertical slit of about 5.7 cm in the middle of their backs at the shoulders to attach them with a hook or similar. These slits seem to be very specific as there are no similar marks on other sculptures from the Riemenschneider workshop known [1, p. 329, footnote 2]. Also, the impressions of a two-pronged clamping tool from the workbench match exactly (Figure 3).

Surface tooling and embellishment

The surfaces of all three figures are very finely crafted and carefully smoothed. The garments and attributes are decorated using both: freehand carving techniques and various punchwork. Michele Marincola was the first to describe these decoration techniques in detail and identified nine different tool marks that were used, including three different motif punchmarks in the shapes of flowers, circles and stars [18]. One pattern appears on both the Saint Elizabeth and the Female Saint but is otherwise not to be observed on other Riemenschneider sculptures, namely a punched pattern of rhombs with little circles in their centers.

As the current comparison has confirmed the assumption that exactly the same tool was used for both sculptures, this technique will be described in more detail here. In the case of Saint Elizabeth, the punched pattern on the high-necked undergarment can only be seen in the X-ray image, as it is covered by later polychromy. To illustrate it, the pattern of the punch was digitally reconstructed (Figure 4a).

The wide side of the tool measures 10 mm, the short side 7 mm. At the Female Saint you find this pattern rotated by 90 degrees at the book's cover and – in the same orientation – at the cloak's border. The black and white raking light of a detail at the Female Saint's cloak border shows very clearly how the tool was formed (Figure 4b).

The points marked with red arrows are raised, as the punchtool was struck into the wood with a minimal offset. In the case of Saint Elizabeth, the tool appears to have been struck with less distance, and in some cases, there is even a slight overlap (Figure 4a).

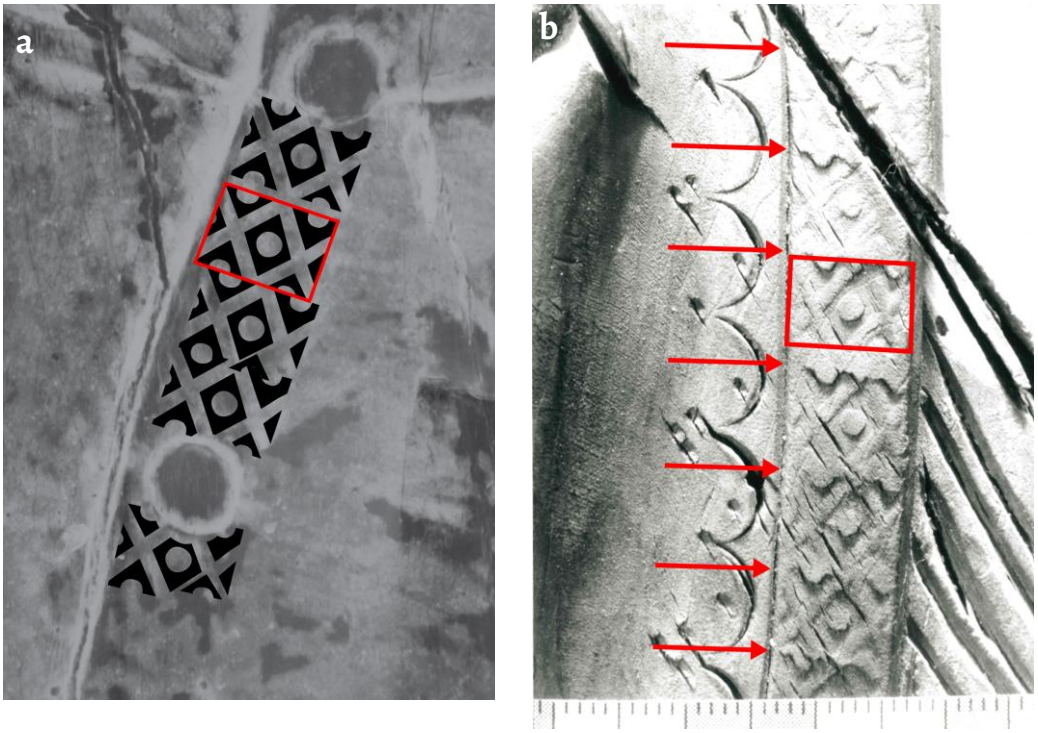

Figure 4. Punch tool with pattern of rhombs with circles in their centers at: *a)* Saint Elizabeth's undergarment's collar; *b)* the Female Saint's cloak's border (photograph: GNM).

Although the wood quality was not perfect with remained knots and added pieces of wood, due to the highly detailed surfaces with the subtle and shallow tooling, it was assumed early that these three sculptures were formerly not polychromed. However, neither wood defects and their repairs are reliable indications of a surface to be painted, nor are extremely finely finished surfaces exclusive indications of a surface not to be painted. Instead, only the characteristics of the oldest polychromy found in addition to the original surface treatment beneath it can provide reliable information. As the polychromy on the Female Saint and Saint Catherine had been completely removed, no evaluable remains of the original surface have survived here. This is why the examination of the polychromy of Saint Elizabeth is so important for the characterization of all three sculptures.

Polychromy – stylistic and technological characteristics

Significant indications that the sculptures were not painted originally, are the stylistic and technological characteristics of the oldest polychromy found on Saint Elizabeth. It was possible to characterise this first polychromy almost completely using portable X-ray fluorescence (pXRF), scanning electron microscopy combined with energy dispersive X-Ray (SEM-EDX) and Fourier transform infrared spectroscopy (FT-IR). The cross-sections of the paint layer samples were prepared by the author at the Institut für Kunsttechnologie und Konservierung (IKK) of the Germanisches Nationalmuseum Nürnberg (GNM). The pXRF-analyses were carried out by Markus Raquet at the IKK. SEM-EDX, FT-IR and Raman Spectroscopy on the cross sections were carried out by Dr. Sylvia Wieland, and Dr. Bernadett Freysoldt (Kunstgutanalytik). All analysis reports are filed in the object file (Pl.O.2413) at the IKK, GNM. Based on the results of these analyses, the polychromy can be described as follows: The paint is oil-bound and based on a thin oil-bound lead-white ground layer. It is dominated by gold and silver leaves that were applied to a thick orange-brown mordent, as well as red glaze. The glaze was both applied directly on the white ground (coat) and on the metal leaves (dress, undergarment, shoe). In contrast to these bright and shiny surfaces, the coat lining was painted matte blue (smalt) and the grass plinth with copper-green. For a better imagination, the surfaces have been digitally reconstructed in colour (Figure 5).

The observations that Marincola made in 1998 about the residues of paint on Saint Catherine and the Female Saint show some similarities. She described a very thin white ground layer, a thick orange-brown mordent, gold leaf and a red glaze on it. The observations essentially correspond to the findings on the oldest polychromy at Elizabeth, as described. Above this oldest polychromy, there is a later one that changed the appearance remarkably. While the former silver veil became a plain white scarf with dark and bright blue stripes, the dress was painted brown with black floral ornaments and the button panel of the undergarment was framed by a black and red coloured diamond pattern. The formerly blue coat lining was painted blue again (smalt). Above this later polychromy, there are residues of several further overpaintings. Two different layers of blue overpaint (one bright, one dark) was found on the former reddish outside of the cloak. The darker blue pigment could be identified as Berlin blue (The pigment identification was carried out using FT-IR on a scattered sample by Frank Mucha in the natural science laboratory of the Department of Conservation and Restoration at the Erfurt University of Applied Sciences. The analysis report is filed in the object file (Pl.O.2413) at the IKK, GNM.) and therefore dates to the eighteenth century at the earliest . This finding also corresponds to Marincola's notes on the paint residues on Saint Catherine and the Female Saint. Two different later layers of blue overpaint are mentioned on the outside of each of their cloaks.

Figure 5. Colour reconstruction of the oldest polychromy of St. Elizabeth.

In summary, the oldest polychromy does not appear to date back to the early sixteenth century. It differs significantly from comparable works from the same period, both from a stylistic and technological point of view. The use of oil as a binder for the primer and paint layers and as an application medium for the large areas of gilding and silvering do not suggest that the work was created in the early sixteenth century, nor does the use of smalt as a pigment for the coat lining. In comparable works from the same region and period, the primer and paint layers are glue-bound, and azurite is used as a blue pigment. From a stylistic point of view, too, the predominantly metallic character (even the headscarf was silver-plated) points to an origin in the late sixteenth or seventeenth century. As there are no further layers of paint under this polychromy, it must be assumed that the sculpture was originally unpolychromed.

Original surface finish

In fact, there are findings of an original monochrome coating under the ground layer directly on the wooden surface that confirm this assumption. The remnants of a reddish coating can be found on the entire frontal surface. In most areas, the remains of the reddish coating are extremely thin or lost completely due to former cleaning and removal of paint layers. However, few remains are still quite thick and shiny with a pronounced inherent craquelure (Figure 6a). Occasionally, there are also accumulations such as drops or running marks (Figure 6b) Samples were taken in four different areas, namely on the outside of the cloak, the dress, the veil, and the face to compare the composition of the findings.

Cross-sections of the samples, analysed through optical microscopy (OM) with ultraviolet (UV) light show a very thin, sparsely pigmented coating directly on the wooden surface – without any dirt or dust in between (Figure 7a-b, marked with white arrows).

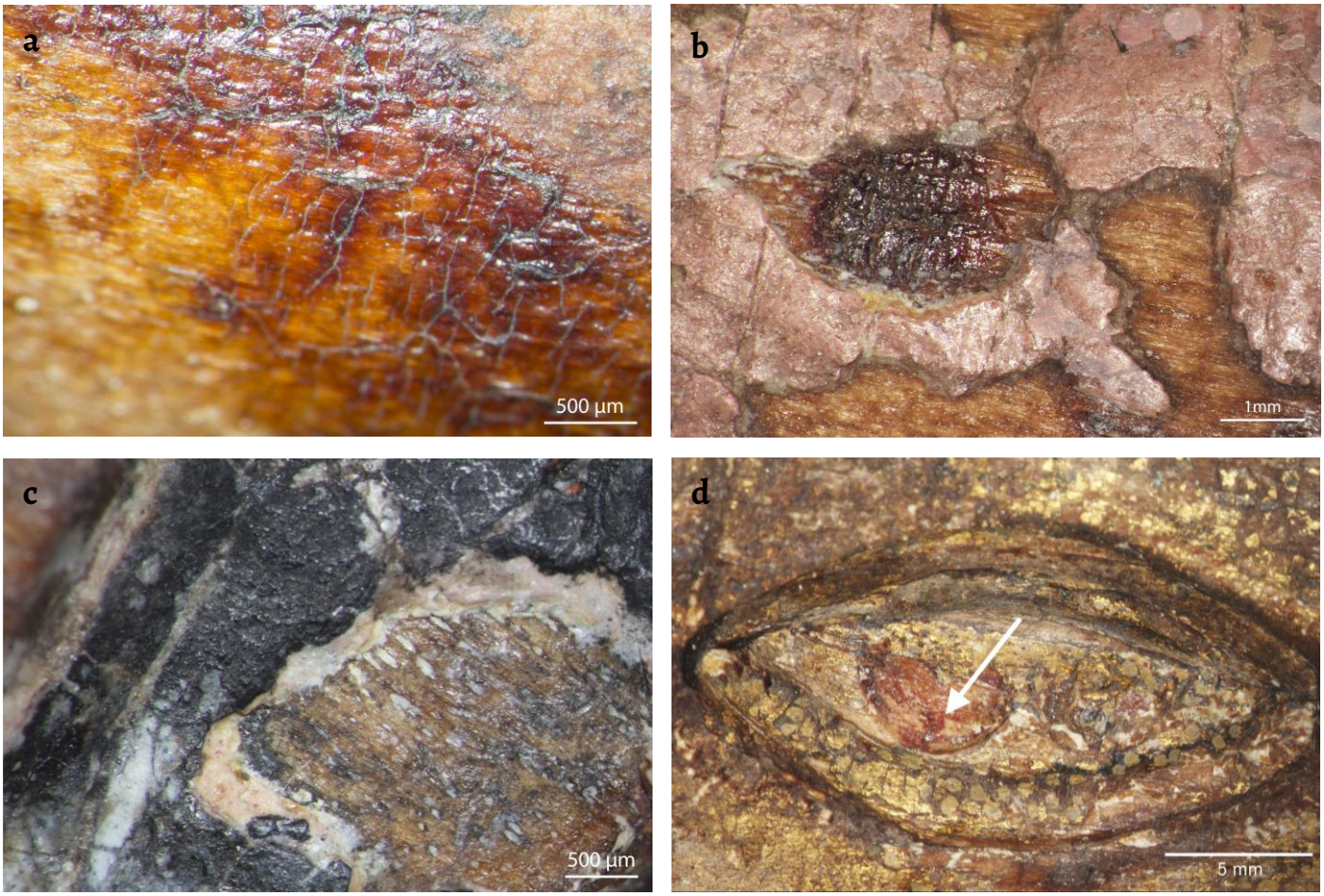

Figure 6. Detail (optical microscopy) of original reddish coating on the dress (a) and face (b), black eye mark (c) and gemstone's red glaze at the cloak's border (d).

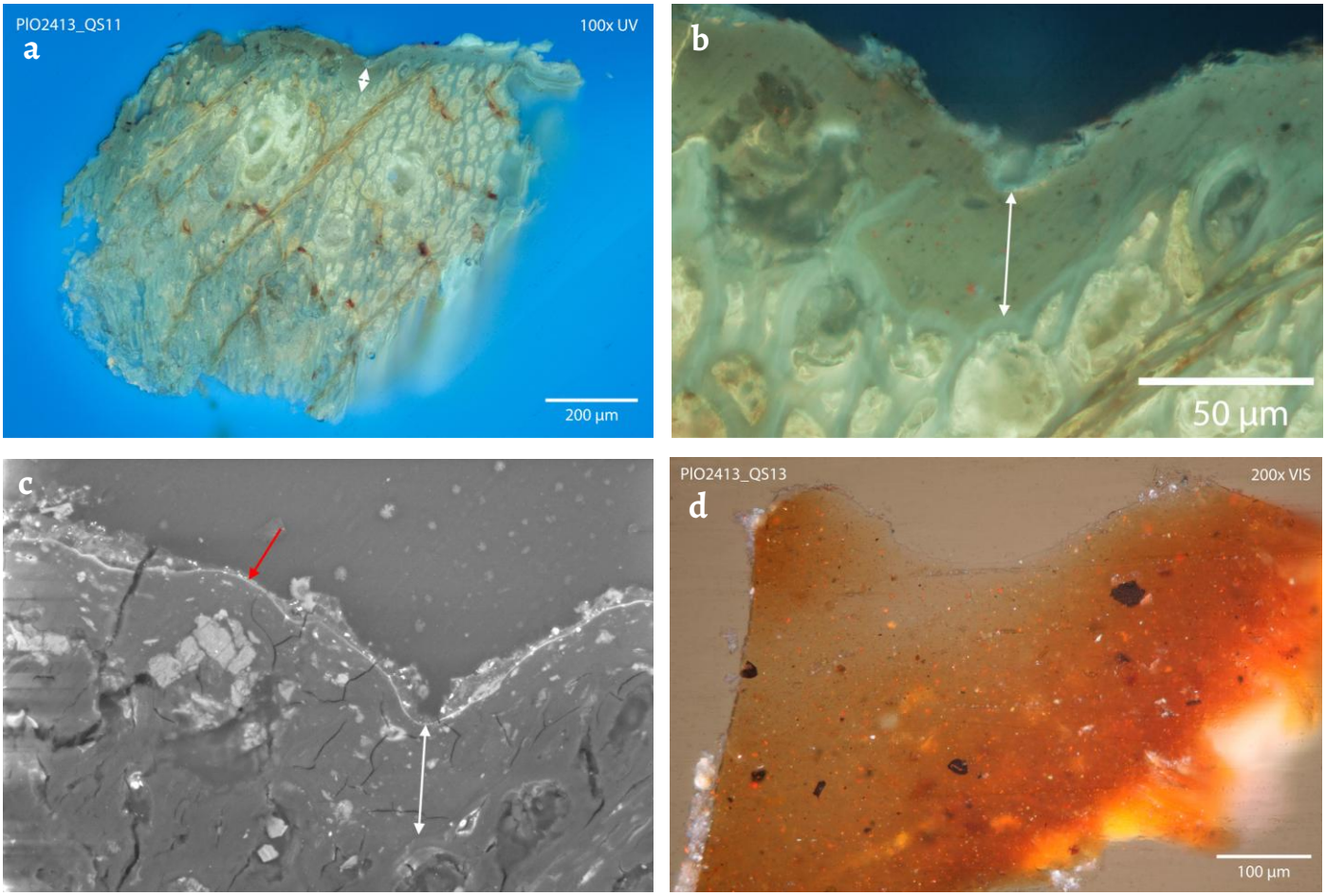

Figure 7. Cross-sections from: *a-b)* the mantle, with original coating marked with white arrows with two different magnifications (OM-UV, photographs: GNM); and *c)* SEM-BSE (photograph: Kunstgutanalytik); *d)* the face (OM-VIS).

This coating was applied to the wood surface as a semi-transparent, film-forming glaze; there is no evidence of a multi-layered structure. In the scanning electron microscopy combined with backscattered electrons (SEM-BSE) image, a very fine white line can be seen on the top of the coating layer (Figure 7c, marked with the red arrow).

This could be a so-called plaster horizon, meaning airborne particles that have accumulated on the surface. This may indicate that this layer has been exposed to the atmosphere for a long time.

The colouring particles can easily be seen in today's orange-brownish binder (Figure 7d). There are tiny red-brown and tiny light orange particles as well as larger black ones. SEM-EDX shows that the tiny light orange particles are minium and the darker red-brown particles are clay minerals. The black particles are carbon black, which could not be identified in more detail so far (The pigment identification was carried out using SEM-EDX and Raman Spectroscopy on the cross sections by Dr. Sylvia Wieland and Dr. Bernadett Freysoldt (Kunstgutanalytik). The analysis reports are filed in the object file (Pl.O.2413) at the IKK, GNM). Due to the morphology, it does not appear to be vine black, but perhaps soot or bistre. A more precise identification was not possible with Raman spectroscopy on the cross-section used and would require analysis with gas chromatography – mass spectrometry (GC-MS), as described by Baumer et al. [19].

The binding agent is Protein, as the FT-IR-spectrum shows. The collagens were identified as bovine (*Bos Taurus*) and the binder is most probably animal glue from cattle (The analysis was carried out at Bordeaux Proteome platform, directed by Caroline Tokarski and mediated by Wim Fremout from KIK-IRPA in Brussels. The method used was a proteomics-based method using the enzyme "trypsin" to break down the proteins in the sample into polypeptides. The resulting mixture of dissolved polypeptides was then separated and analysed by LC-MS/MS.

The analysis report is filed in the object file (Pl.O.2413) at the IKK, GNM). It contains neither egg, nor oil nor gum additives as has been published on other Riemenschneider sculptures in the past [2, 20-22].

While the reddish coating can be found on all frontal areas of the sculpture, the large gemstone on the mantle edge is accentuated more brightly (Figure 6d and Figure 8). The redder colouration is not due to a more concentrated pigmentation of the coating but was achieved with a red glaze. According to the UV image of the cross section (Figure 8b), it could be a red lake pigment in a resin.

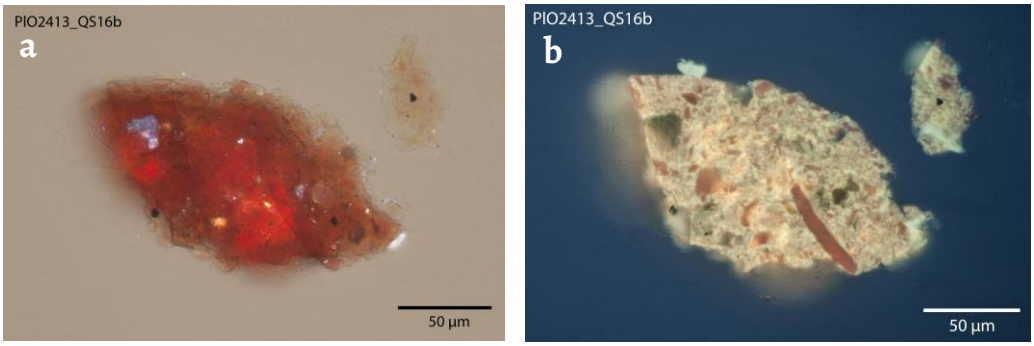

Figure 8. Cross-section of the gemstone's red glaze with: *a)* visible light; *b)* reflected light.

The eyes were painted black (Figure 6c). It looks as if the black paint is lying directly on the wood. No clear remains could be found on the lips; here the findings rather indicate that just the reddish coating was used, perhaps a little more pigmented.

Overall, the sculptures must therefore have had a monochrome reddish overall impression, whereby the coating was perhaps pigmented to varying degrees depending on the section.

Contextualising

The results were compared with the findings on other monochrome sculptures from this period with a focus on Riemenschneider. It should be noted that monochrome coatings were found on almost all the sculptures examined, in which polychromy was either never applied or applied long after the carving was completed.

Rothenburg altarpiece (1501-1504)

As early as 1965, Eike Oellermann described a transparent, brownish-yellowish coating for the Rothenburg altarpiece of the Holy Blood, made by Tilman Riemenschneider and his workshop around 1501-1504. According to analyses at that time, this coating contains egg white, oil, very little ochre, gypsum, white lead (maybe as a siccative?) and vine black [22]. This coating is said to have been applied in a modelling manner and probably twice in some cases when the shrine was already assembled. Those parts of the sculptures that were later concealed in the shrine are not coated; drops and traces of the glaze could be found on these areas. A red lip mark and a black eye mark could be found under the coating directly on the wood. The interpretation of the analysis results has often been questioned [14, p. 26; 23, p. 11; 24, p. 204]. The low concentrations and the complex mixture of components gave reason to interpret the colouring components as impurities of a transparent binder coating. In addition, the analytical possibilities at the time were naturally less accurate than they are today.

Münnerstadt altarpiece (1492)

Oellermanns 1981 published findings on Riemenschneider's Münnerstadt altarpiece were supplemented by Rudolf Göbel since the late 1990s. While Oellermann described a transparent yellowish coating that is said to have penetrated deep into the wood and to contain mainly

protein with small amounts of oil as well as iron oxide pigments, lead white and vine black [21], Göbel used high performance liquid chromatography (HPLC) to detect a yellow natural dye in the uppermost wood substance (maybe Morin) [25-27]. Since the dye was found in the wood substance and the pigments in the layer on the surface, it is not entirely clear, whether there are two layers or processes involved. The common interpretation is of one yellow dyed medium, similar to a stain, which penetrated into the wood and one proteineous, pigmented coating above it. This raises the question, whether the structure of the wood, as well as knots and repairs, would have been intensified by a coloured stain if it had been applied first. Bernd Bünsche, who has already discussed this in 2005, suspected that this glaze was merely a dye dissolved in an animal glue solution or in oils, which is why, in his opinion, it did not have the structure-reinforcing effect of a stain [28, p. 111]. However, the medium would then only have had the penetration depth of a pure low concentrated animal glue solution, which would not explain the high penetration depth described.

As in the Rothenburg altarpiece, the eyes were accentuated under the coating in black and the lips in red.

Creglingen altarpiece

The time and place of the Creglingen altarpieces creation are the subject of controversial debate following the most recent study by Volker Schaible [29]. While the altarpiece made by Tilman Riemenschneider was previously dated to around 1505-1508, Schaible interprets it as a predecessor of the Rothenburg Altarpiece of the Holy Blood and dates it to 1496. Schaible also presents new results regarding the technological findings: according to him, the altarpiece was never painted and never glazed. He concludes this from the lack of evidence of a surface coating. Apart from residues of wood preservatives, no evidence of any binding medium, pigments or even caustics could be found. The absence of caustic residues in particular is interpreted as evidence that the altar was never painted. In fact, despite these findings, it is difficult to imagine that the raw wooden surface was left untreated and has remained so to this day.

Goschof altarpiece (about 1512-1517)

The Goschof altarpiece by Hans Brüggemann was made of oak around 1512-1517. The most recent findings of an original pigmented coating should be mentioned here because very thorough analyses were carried out in an attempt to compare the findings with those on Riemenschneider's works. A dark, semi-transparent glaze-like coating was found on both the body of the altarpiece and the group of figures. Lips and eyes are marked in colour, and the pupils are even carved. In 1998, protein respectively animal glue was identified as a binding agent and carbon black as a colouring pigment. With the discovery of the dye on the Münnerstadt altar in mind, particular attention was paid to indications of the presence of a dye. However, initial indications of the presence of a natural dye could not be confirmed in 2001 (pub. 2005), even with HPLC analyses [28, p. 108].

Discussion of the findings

Comparing the results of the investigation of the sculpture of Saint Elizabeth with the findings on other altarpieces, similarities but also differences can be identified. The sparse pigmentation and the use of animal glue as a binder for a monochrome coating of the wooden surface are consistent with most of the other results.

Of particular interest in this context is the question of the presence of a natural dye, as has been identified in the Münnerstadt altarpiece [21, 26], using HPLC analyses carried out on scraped samples of the wood surface. The dye apparently caused a yellowish appearance of the wooden surfaces. In contrast to this, the wood surface of St. Elizabeth, which is exposed in

large areas, appears brown-reddish. The colouration can have various causes. It may have been caused by components of the original coating or a medium, similar to a stain, that was applied to the wood surface underneath, or by more recent coatings that have penetrated the wood, or by the wood preservative with which the sculpture was once treated.

Considering the high quality of the sculpture, it was decided not to further harm the original wooden surface by taking samples for HPLC analyses. Instead, another method was tested, which keeps the sculptural surface intact: Extraction with Nanogels. The idea for this arose during the conservation treatment of the sculpture. Nanorestore Gels were used to soften the modern brown coating, that was supposed to be removed from the surface of the sculpture. When being used on the already cleaned wood surface they turned strongly yellow, leaving behind a lighter and matter wooden surface. It became obvious that water soluble colouring components in the wood were extracted into the nanogel. Therefore, samples of the "coloured" Nanogel were analyzed with HPLC-PDA-HRMS. The results do not show traces of natural dyes. The yellow colouration therefore must have other causes than the original coating or a dyed medium, similar to a stain, applied to the wood surface.

Conclusions

To summarize, the most recent investigation confirmed the assumption that the sculpture of Elizabeth was originally not polychromed. This can also be assumed for the two associated sculptures of Catherine and the Unknown Saint. The findings suggest that the sculptures had a monochrome, slightly reddish wooden surface with lips and eyes marked as well as small decorative details like gemstones highlighted in red. Due to the small amount of material residues, it is difficult to visualize what the coating of the wooden surface might have originally looked like. A digital reconstruction gives an impression of the original surface finish (Figure 9). As the sculpture of Elizabeth is largely covered with later polychromy, the Female Saint from Compton Verney was chosen for this reconstruction.

Figure 9. The Female Saint: *a)* current state (Compton Verney, Jamie Woodley); *b)* digital reconstruction of what the original surface might have looked like.

The analyses carried out on the sculpture of Elizabeth showed that the coating is based on bovine glue, coloured with traces of red and black pigments. As the question of a colouration with dyes has been discussed at least since a yellow dye was discovered on the Münnerstadt altarpiece, an attempt was made to investigate this issue for Elizabeth. Once it became clear that no natural dye is present in the uppermost wood substance, it seems more likely that the pigmentation of the glue coating was the main factor for the reddish colouring of the wood surfaces and not the addition of a dye.

It seems reasonable that Tilman Riemenschneider used different surface finishes on monochrome retables - different in colour and technique.

Questions as complex as the analyses of original surface coatings, which have usually been altered, superposed, and partially removed by previous (conservation) treatments of the artefact, cannot be answered easily. It is important to complement older findings with new investigations and methods, although the comparison of analytical results remains a challenge, as object histories differ and methods of sampling and analysis are evolving. Therefore case studies as the one presented above enhance our knowledge about monochromed sculptures – even if they do not provide all the answers we were looking for.

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